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Indian Standard

ALKALINE MANGANESE DIOXIDE CELLS — SPECIFICATION

ICS 29.220.10

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 2001

Price Group 3

Primary Cells and Batteries Sectional Committee, ET 10

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by Primary Cells and Batteries Sectional Committee had been approved by the Electrotechnical Division Council.

Alkaline manganese dioxide cells and batteries are increasingly being used in the country. With the growth in use of smaller hand held appliances and the need for the appliances to have a power source, which can deliver larger currents, alkaline manganese dioxide cells have become a commonly used portable power solution. Some of the most common appliances are flashlights, portable radios, sterio players, photo cameras, clocks, motorized toys/games, remote controls, etc. Applications as electronic diaries, hand held computers, video cameras and other web enabled portable devices are expected to become very common.

The Committee had felt the need to bring out Indian Standard on this subject. Hence, first edition of this standard is being published. This standard covers 5 types of cells/batteries which are most commonly used. The standard also provides a framework on which other types of batteries can be included over a period of time when they get into common use.

In the preparation of this standard, assistance has been derived from IEC 86-(2)-1994 and JIS C8511-1993.

The composition of the Committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off values should be the same as that of the specified value in this standard.

Indian Standard

ALKALINE MANGANESE DIOXIDE CELLS — SPECIFICATION

1 SCOPE

This standard covers the dimensions, tests and the performance requirements of primary alkaline Manganese dioxide cells of designation LR03 (AAA), LR6 (AA), LR14 (C), LR20 (D), 6LR61 (9 V) (The designations given in bracket denote the commonly understood cell nomenclature).

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
1248 (Part 2) : 1983	Direct acting indicating analogue electrical measuring instruments and their accessories: Part 2 Ammeters and voltmeters
1885 (Part 15) : 1967	Electrotechnical vocabulary: Part 15 Primary cells and batteries
2652 : 1976	Schedule of terminals for Leclanche type primary batteries (*first revision*)
6303 : 1984	General requirements and methods of test for dry cells and batteries

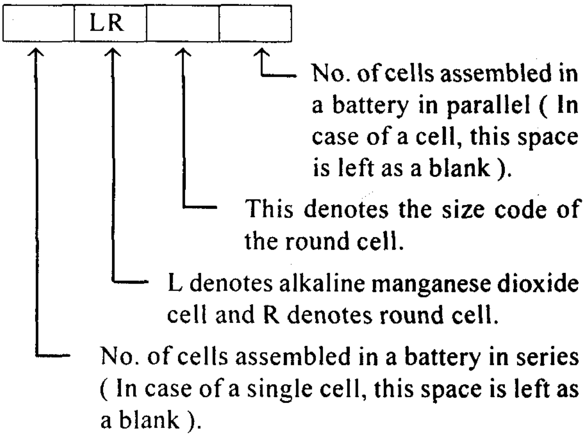
3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1885 (Part 15) shall apply.

The words battery and cell are used interchangeably in this standard as this covers both of them.

4 DESIGNATION

The cells/batteries are designated by a code comprising of four parts:



No. of cells assembled in a battery in parallel (In case of a cell, this space is left as a blank).

This denotes the size code of the round cell.

L denotes alkaline manganese dioxide cell and R denotes round cell.

No. of cells assembled in a battery in series (In case of a single cell, this space is left as a blank).

For the cells / batteries covered under this standard, Table 1 shows the cell codes and corresponding description and common names.

Table 1 Cell Codes and Corresponding Description and Common Names

Sl No.	Code	Description	Commonly Used Name
(1)	(2)	(3)	(4)
i)	LR03	Alkaline round cell of size code 03	AAA
ii)	LR6	Alkaline round cell of size code 6	AA
iii)	LR14	Alkaline round cell of size code 14	(C)
iv)	LR20	Alkaline round cell of size code 20	D
v)	6LR61	Battery constructed with 6 round cells of size code 61 connected in series	9 V

5 DIMENSIONS

The standard overall dimensions of cells / batteries and nominal voltages are shown in Tables 2A and 2B.

6 MATERIALS AND CONSTRUCTION

6.1 The chemical system of the cell / battery shall be:

a) Manganese dioxide (cathode);

b) Zinc (anode); and

c) Potassium hydroxide solution in water (electrolyte).

6.2 The internal design of the cell / battery and the choice of material shall be such that the product meets the following criteria:

a) The terminals shall be free from corrosion;

b) Terminals should maintain positive contact with external circuits;

c) There shall not be any distortion / dents;

d) There shall not be any leakage of electrolyte during normal storage and use under normal discharge conditions; and

e) There shall be a system of venting to prevent the explosion due to generation of hydrogen gas inside the cell during storage/discharge/ usage.

7 BATTERY CONNECTIONS

7.1 In all assembled batteries, electrical connections between cells and terminals shall be permanent and preferably of a welded construction.

7.2 All soldered or welded connections shall be made in such a manner as not to interfere with subsequent battery performance.

8 TERMINALS

The types of the terminals for the batteries shall be in accordance with IS 2652.

9 MARKING

9.1 Marking of Terminals

Each terminal shall be clearly marked with the relevant nominal voltage and polarity, where applicable.

9.2 Marking of Batteries

Each battery shall be marked with the following information:

a) Designation;

b) The expiration data of the guarantee period, in clear; and

c) Name or trade mark of the manufacturer or supplier.

9.3 BIS Certification Marking

The product may also be marked with the Standard Mark.

9.3.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the rules and regulations made thereunder. The details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

10 TESTS

10.1 General

All the tests specified in this standard refer to the entire battery and not to any intermediate voltage tap which may be available.

The batteries selected for discharge shall stand for not less than 16 hours in the standard atmospheric conditions as specified in **10.2.3**.

10.2 Test Equipment

10.2.1 *Voltmeter*

The voltmeter used in the tests shall be of an accuracy class of 0.5 or better. The resistance of the voltmeter shall be at least 1 000 ohms per volt [*see* IS 1248 (Part 2)]. The voltmeter of an appropriate range shall be chosen.

Table 2A Dimensions of Round Cells and Nominal Voltage

(*Clause* 5.1)

Sl No.	Code	Minimum Diameter mm	Maximum Diameter mm	Minimum Height mm	Maximum Height mm	Nominal Voltage
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	LR03	9.5	10.5	43.3	44.5	1.5 V
ii)	LR6	13.5	14.5	49.2	50.5	1.5 V
iii)	LR14	24.9	26.2	48.6	50.0	1.5 V
iv)	LR20	32.3	34.2	59.5	61.5	1.5 V

Table 2B Dimensions of 6LR61 Battery and Nominal Voltage

(*Clause* 5.1)

Code	Length, mm		Width, mm		Height, mm		Nominal Voltage
	Min	*Max*	*Min*	*Max*	*Min*	*Max*	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
6LR61	24.5	26.5	15.5	17.5	46.5	48.5	9.0 V

Centre distance between socket (–) and stud (+) : 12.45 to 12.95 mm.

10.2.2 *Discharge Resistance*

The discharge resistance shall include the resistance of all the parts of the external circuit, the total value of this at any time during the test shall be within ± 0.5 percent of the specified value.

10.2.3 *Standard Atmospheric Condition of Testing*

Unless otherwise specified, the tests specified in the standard shall be carried out in an atmosphere with a temperature of 27 ± 2°C and a relative humidity between 45-75 percent.

10.2.4 *Classification of Tests*

The tests shall be classified as type, acceptance and routine tests.

10.2.4.1 *Type Tests*

These are the tests carried out to prove conformity with the requirements of this standard. These are intended to prove the general quality and design of a given type of cell or a battery. The following shall constitute the type tests:

a) Checking of dimensions and terminals (*see* **5.1** and **8.1**);
b) Materials and construction (*see* **6.1** and **6.2**);
c) Checking of markings (*see* **9.1**);
d) Initial life (*see* **11.2** and **11.3**);
e) Delayed life (*see* **13.1**); and
f) Leakage test for batteries (*see* **12.1**).

The number of samples for the type test shall be as given in Table 3.

Table 3 Number of Samples for Type Test

Tests	LR6	6LR61	All Others
(1)	(2)	(3)	(4)
Checking of dimensions and checking of markings	25	19	22
Initial life and other tests as per test schedule	18	12	15
Delayed life	3	3	3
Materials and construction	1	1	1
Leakage	3	3	3
Total No. of samples	25	19	22

10.2.4.2 *Acceptance Tests*

These are tests carried out on samples taken from a lot for the purpose of acceptance of a lot. The following shall constitute the acceptance tests:

a) Checking of dimensions and terminals (*see* **5.1** and **8.1**);
b) Checking of marking (*see* **9.1**); and
c) Initial life (*see* **11.2** and **11.3**).

A recommended sampling plan for acceptance tests and the criteria for acceptance shall be in accordance with Annex A of IS 6303.

11 LIFE TEST

11.1 There are two kinds of initial life tests (Continuous discharge initial life test and intermittent discharge initial application test) and one delayed life test.

11.2 Continuous Discharge Initial Life Test

In this test, fresh battery is discharged through a fixed resistance till the end point on-load voltage is reached for the first time. Table 4 shows the test regime and minimum performance requirement for the various sizes.

11.3 Intermittent Discharge Initial Application Test

These tests are carried out to simulate the use of cells in applications. The cells are put under test and are discharged as per the regime given in the table under each cell size. The closed circuit voltage at the end of discharge period of each day shall be noted. The test is ended the moment, the closed circuit voltage reaches the end voltage point for the first time.

The duration of on load time which has elapsed from the starting of the test till the end-point is called the life.

The initial life of the batteries shall be not less than the appropriate rated life values specified in Tables 5A to 5E. These tables list down the test regime and the minimum life.

12 LEAKAGE TEST

Three cells are stored at 45 ± 2°C (humidity < 70 percent) for a period of 30 days and are observed for leakage of electrolyte or sealing compound.

No electrolyte, sealing compound or other internal component shall appear on any of the external surface of the battery. No deformation of cells shall take place.

13 DELAYED LIFE TEST

The samples shall be stored at 27 ± 2°C for a period of 12 months. After storage, the batteries shall be tested in accordance with the table given below. The life of batteries shall be not less than the appropriate values specified in Table 6.

14 CODE OF PRACTICE FOR TRANSPORTATION, STORAGE, USE AND DISPOSAL BATTERIES

See Annex B of IS 6303.

Table 4 Test Regime and Minimum Performance Requirement for Continuous Discharge Initial Life Test

(*Clause* 11.2)

Sl No.	Type	Load Ohm	No. of Cells to be Tested	Test Condition	Cut off Voltage	Minimum Requirement h
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	LR03	75	3	Continuous	0.8	50
ii)	LR6	43	3	Continuous	0.8	70
iii)	LR14	20	3	Continuous	0.8	83
iv)	LR20	10	3	Continuous	0.8	88
v)	6LR61	620	3	Continuous	4.8	38

Table 5A Initial Discharge Application Test Regime and Minimum Performance Requirements for LR 03

(*Clause* 11.3)

Application	No. of Cells to be Tested	Load per Cell Ohm	Test Pattern	Cut Off Voltage V	Requirement
(1)	(2)	(3)	(4)	(5)	(6)
Flash light	3	5.1	4 min/h 8 h/day	0.9	136 min
Cassette players and tape recorders	3	10	1 h/day	0.9	5.25 h
Transistor radio	3	75	4 h/day	0.9	46.0 h
Pulse test	3	3.6	15 sec/min 24 h/day	0.9	367 cycles

Table 5B Initial Discharge Application Test Regime and Minimum Performance Requirements for LR6

(*Clause* 11.3)

Application	No. of Cells to be Tested	Load per Cell Ohm	Test Pattern	Cut Off Voltage V	Requirement
(1)	(2)	(3)	(4)	(5)	(6)
Transistor radios	3	43	4 h/day 5d/w	0.9	63 h
Motor toy	3	3.9	1 h/day	0.8	4 .2 h
Cassette players and tape recorders	3	10	1 h/day 5 d/w	0.9	11.6 h
Photoflash	3	1.8	15 s/min 24 h/d	0.9	336 cycles
Flash lights	3	3.9	4 min/h 8 h/day	0.9	5 h

Table 5C Initial Discharge Application Test Regime and Minimum Performance Requirements for LR14

(*Clause* 11.3)

Application	No. of Cells to be Tested	Load per Cell Ohm	Test Pattern	Cut Off Voltage V	Requirement
(1)	(2)	(3)	(4)	(5)	(6)
Flash light	3	3.9	4 min/h 8 h/day	0.9	765 min
Cassette players and tape recorders	3	6.8	1 h/day	0.9	24.2 h
Transistor radios	3	20	4 h/day	0.9	80 h
Motor toys	3	3.9	1 h/day	0.8	12.6 h

Table 5D Initial Discharge Application Test Regime and Minimum Performance Requirements for LR20

(*Clause* 11.3)

Application	No. of Cells to be Tested	Load per Cell Ohm	Test Pattern	Cut Off Voltage V	Requirement
(1)	(2)	(3)	(4)	(5)	(6)
Flash light	3	2.2	4 min/h 8 h/day	0.9	820 min
Cassette players and tape recorders	3	3.9	1 h/day	0.9	26.2 h
Transistor radios	3	10	4 h/day	0.9	85 h
Motor toys	3	2.2	1 h/day	0.8	16.5h

Table 5E Initial Discharge Application Test Regime and Minimum Performance Requirements for 6LR61

(*Clause* 11.3)

Application	No. of Cells to be Tested	Load per Battery Ohm	Test Pattern	Cut Off Voltage V	Requirement
(1)	(2)	(3)	(4)	(5)	(6)
Transistor radio	3	620	2 h/day	5.4	35 h
Pocket calculator	3	180	30 min/day	4.8	10 h
Toys	3	270	1 h/day	5.4	15 h

Table 6 Minimum Performance Requirements and Test Regime for Delayed Life Test

(*Clause* 13.1)

Type	Load Ohm	No. of Cells to be Tested	Test Condition	Cut off Voltage	Minimum Requirement h
(1)	(2)	(3)	(4)	(5)	(6)
LR03	75	3	Continuous	0.8	40
LR6	43	3	Continuous	0.8	56
LR14	20	3	Continuous	0.8	66
LR20	10	3	Continuous	0.8	70
6LR61	620	3	Continuous	4.8	30

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Primary Cells and Batteries Sectional Committee, ET 10

Organization	*Representative(s)*
Matsushita Lakanpal Battery India Ltd, Vadodara	Shri M. M. Sharma (***Chairman***)
Association of Dry Manufacturers, New Delhi	Shri Kalbey Ali Khan
BPL Ltd, Bangalore	Shri Gautam Buddha Basu Shri Ajai Baijal (*Alternate*)
Central Electrochemical Research Institute, Chennai	Dr M. V. Ananth Dr N. Venkatakrishnan (*Alternate*)
Central Mining Research Institute, Dhanbad	Shri U. S. Nigam Shri N. L. Das (*Alternate*)
Consumer Education and Research Centre, Ahmedabad	Shri S. N. Desai Ms Shveta Sheth (*Alternate*)
Consumer Guidance Society of India, Mumbai	Shri A. K. Dhumak Dr A. R. Shenoy (*Alternate*)
Department of Telecommunications, Bangalore	Shri T. K. Chandrashekhar Asst General Manager (E - 10B) (*Alternate*)
Directorate General of Supplies and Disposals, New Delhi	Shri B. V. K. Raja Shri S. G. T. Naik (*Alternate*)
Duracell India Pvt Ltd, Gurgaon	Shri R. Gopal Shri Anil Kumar (*Alternate*)
Everyday Industries India Ltd, Kolkata	Shri L. N. Gurumurthi Dr G. Roop Kumar (*Alternate*)
HMT Ltd, Bangalore	Shri K. B. Ramakrishna Shri S. K. Borah (*Alternate*)
Indo National Ltd, Chennai	Shri P. Cannon Shri C. Sathyanarayana (*Alternate*)
Matsushita Lakanpal Battery India Ltd, Vadodara	Dr Krishnan Basavaswaran Shri Shaji Zachariah (*Alternate*)
Ministry of Defence, New Delhi	Shri B. V. K. Raja Shri S. G. T. Naik (*Alternate*)
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National Test House, Kolkata	Shri T. K. Bhattacharyya Shri R. Ramakrishna (*Alternate*)
Research Design and Standards Organization, Lucknow	Joint Director Standards Sinngla-2 Joint Director S & T Inspection (*Alternate*)
RITES, Chennai	Shri K. K. Varrier Shri P. R. Sircar (*Alternate*)
Shervani Industrial Syndicate Ltd, Allahabad	Shri Khalil Ahmad Shri Z. U. A. Sharvani (*Alternate*)
Small Scale Dry Battery Mfrs Association, Sangli	Shri Deepak Bhaskar Ranade Shri Mohan Rajpal (*Alternate*)
BIS, Directorate General	Shri K. M. Bhatia, Director (Elec tech) [Representing Director General (*Ex-officio*)]

Member-Secretary
Shri D. Goswami
Joint Director (Elec tech), BIS

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